Sod-Based Crop Rotations in the Southern Piedmont: Summary of Historical Research in Watkinsville

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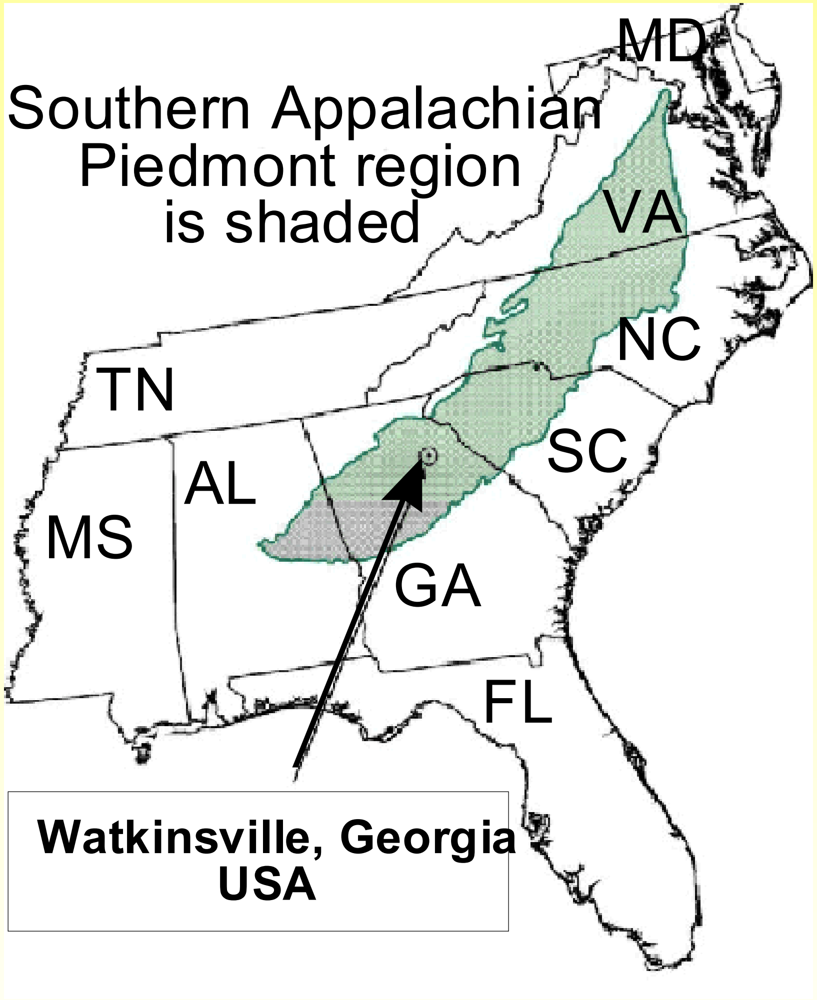
Watkinsville Experiment Station

- Established 1 Jan 1937 as part of SCS
- 1952 – USDA-ARS
- Directors
  - Bert H. Hendrickson (36-55)
  - John R. Carreker (55-58)
  - Gerald G. Williams (58-61)
  - Anson R. Bertrand (61-64)
  - James E. Box Jr. (65-84)
  - Maurice H. Frere (85-94)
  - Jean L. Steiner (94-01)
  - D. Wayne Reeves (02-pres)



Past and Present Mission

Soil and Water Conservation

Rationale

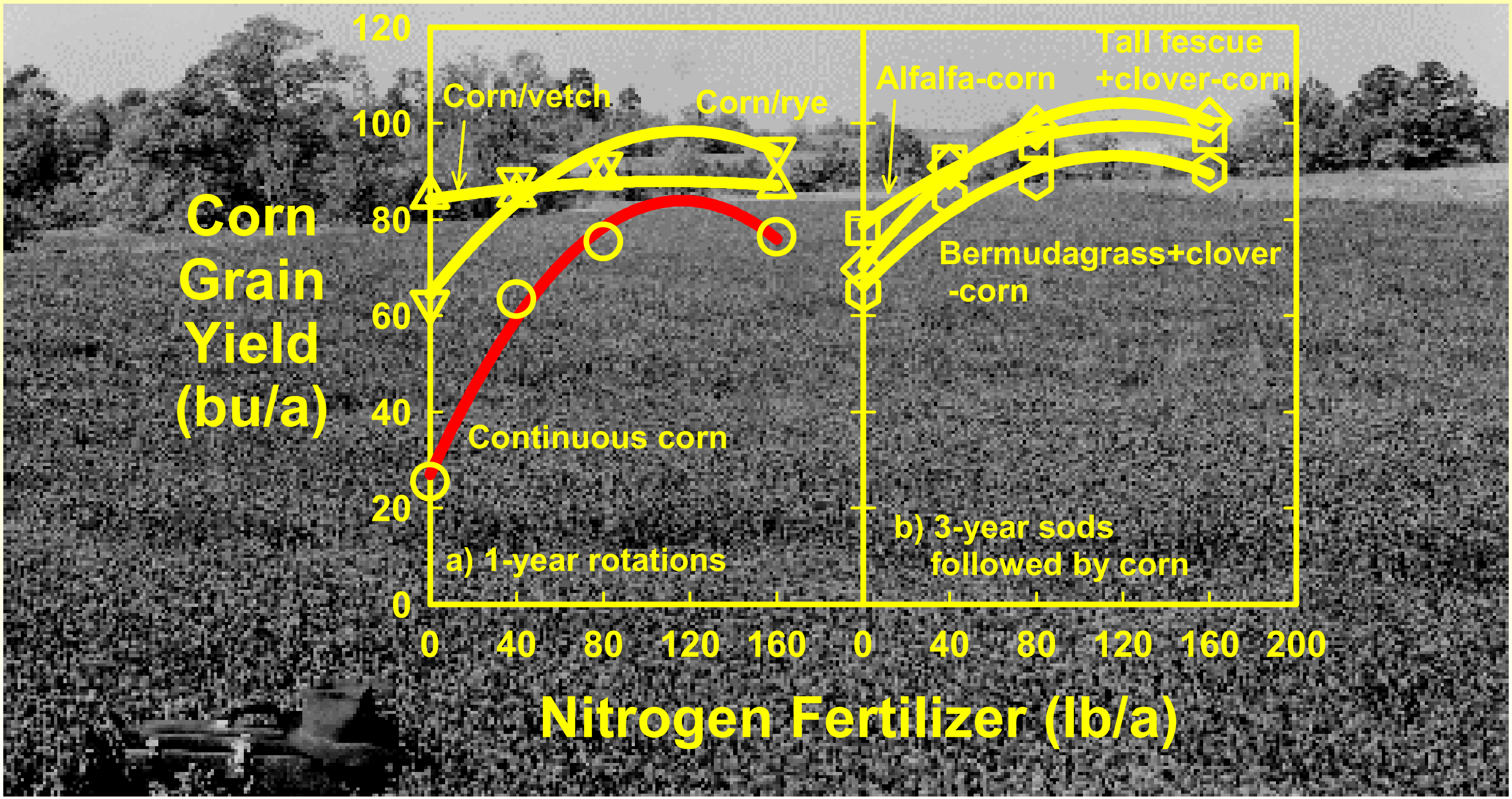
- Carreker et al. (1977; *Soil and Water Management Systems for Sloping Land*) wrote:
  - “Rain on clean- tilled soil cause high rates of runoff and soil loss
  - High temperature in the southeastern USA causes rapid depletion of soil organic matter
  - Cropping systems are needed to replenish soil organic matter, to maintain high infiltration to reduce surface runoff and prevent soil erosion, to prevent leaching of nutrients from soil, to restore soil fertility, and to maintain good soil structure
  - Studies were conducted at the Southern Piedmont Conservation Research Center to fulfill those needs”

Rationale

- Hendrickson et al. (1963; *Conservation Methods for Soils of the Southern Piedmont*) wrote:
  - “The most promising single answer to the persistent row-crop erosion hazard on sloping land has been the increasing use of the highly protective grass-based crop rotations”
- This presentation summarizes historical research from Watkinsville on 4 topics:
  - Historical long-rotation sequences of 4-10 years
  - Contemporary short-rotaton sequences with legumes
  - Intercropping of row crops in perennial sods
  - Forage management for production and conservation

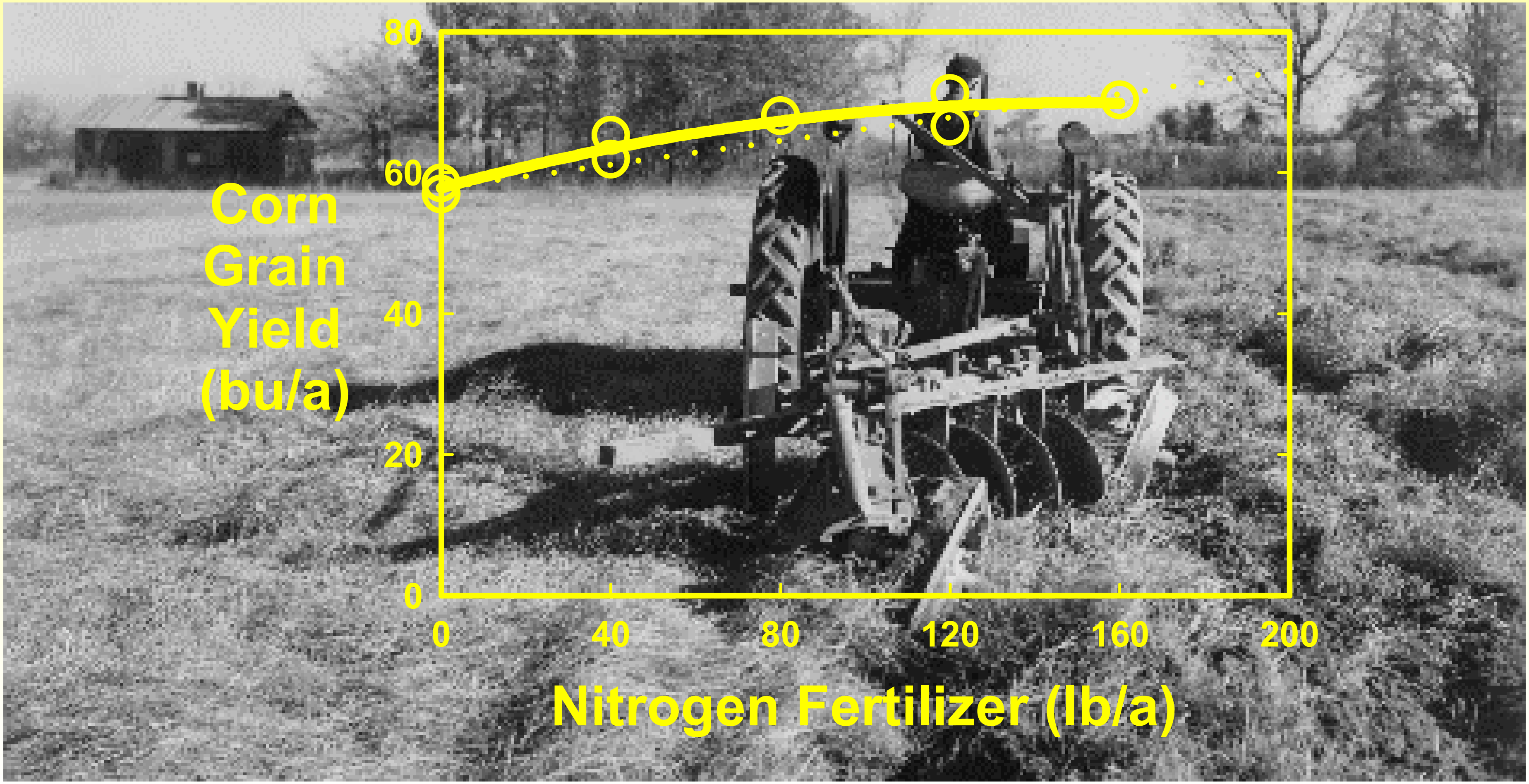
Long Rotations

Corn grain yield response to N fertilizer as affected by previous crop (7-year means) Adams et al. (1970)



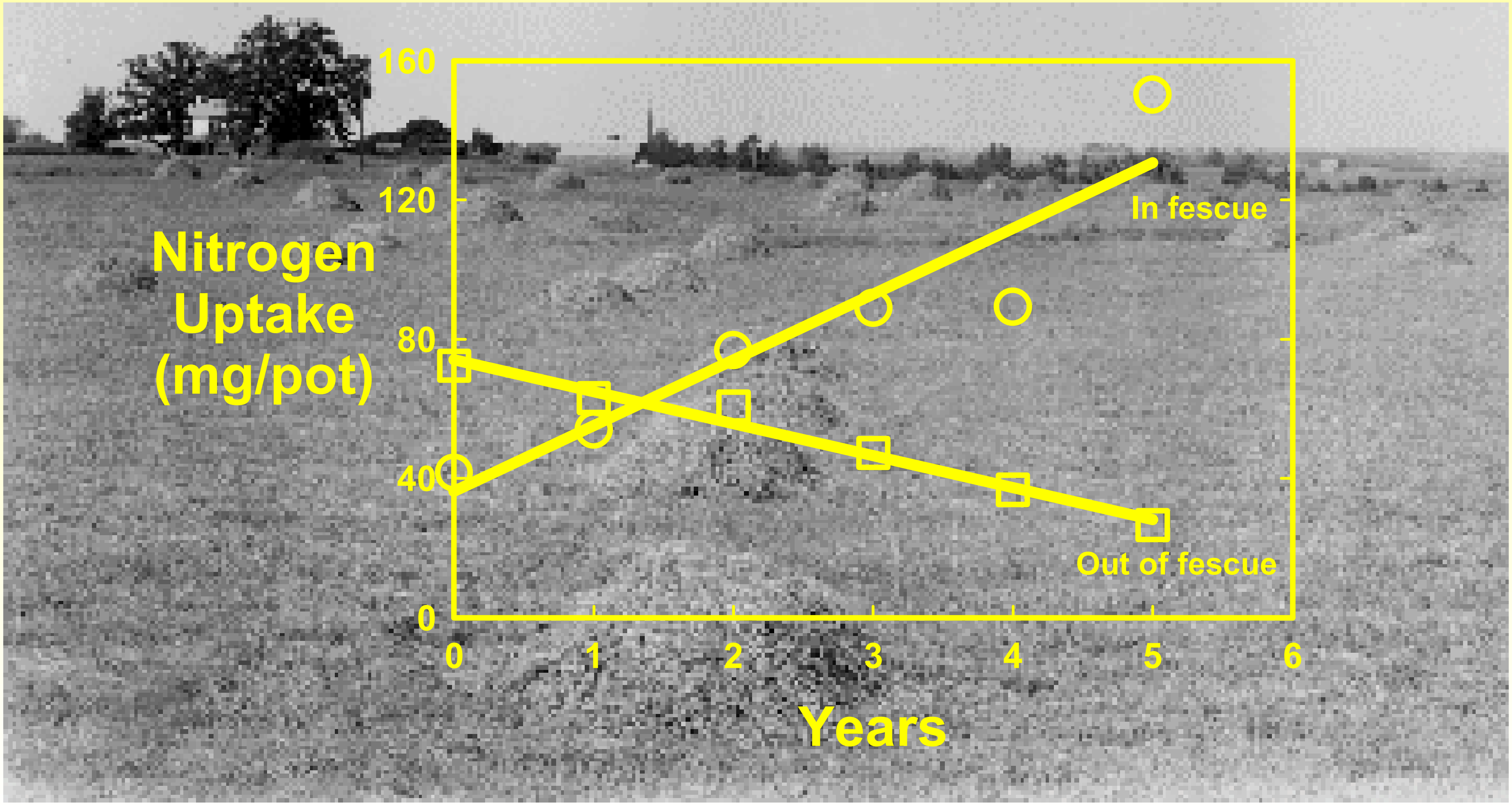
Long Rotations

Corn grain yield response to N fertilizer following 5-year stands of tall fescue or bermudagrass (mean of 14 Piedmont locations) Parks et al. (1961)



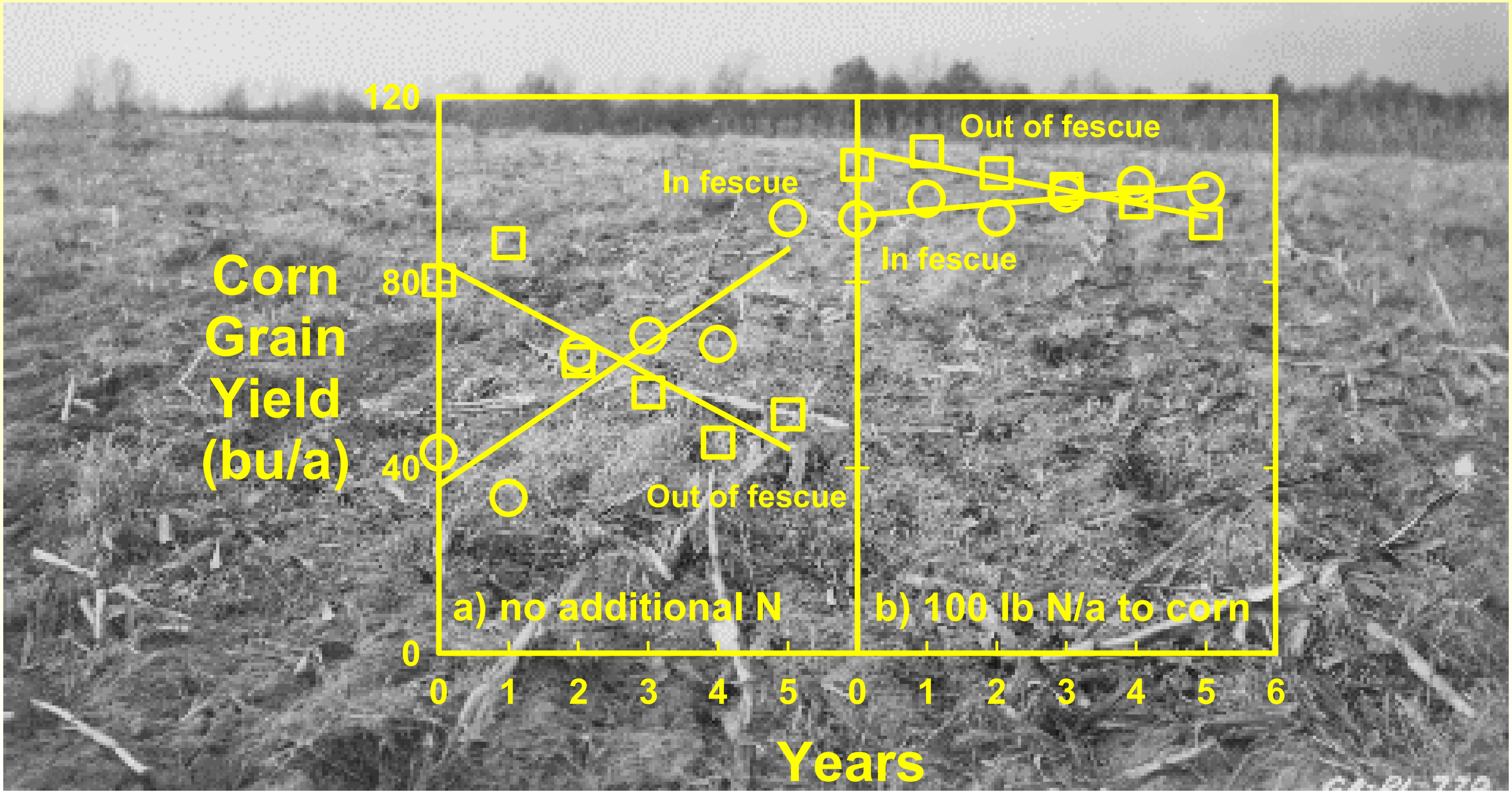
Long Rotations

N uptake by sorghum-sudangrass in GH from soil under different ages of sod. Giddens et al. (1971)



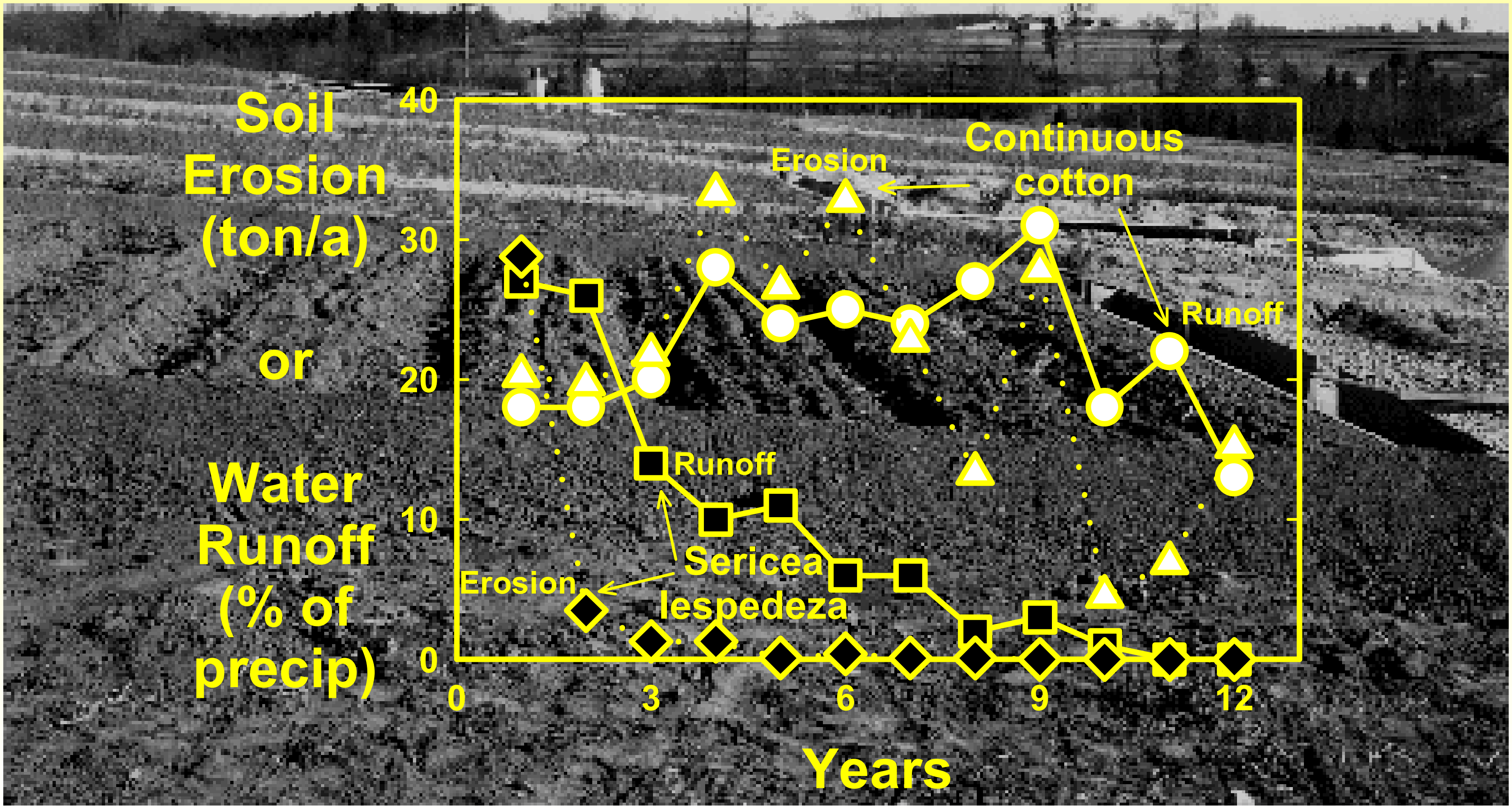
Long Rotations

Corn grain yield as affected by number of years following tall fescue sod. Giddens et al. (1971)



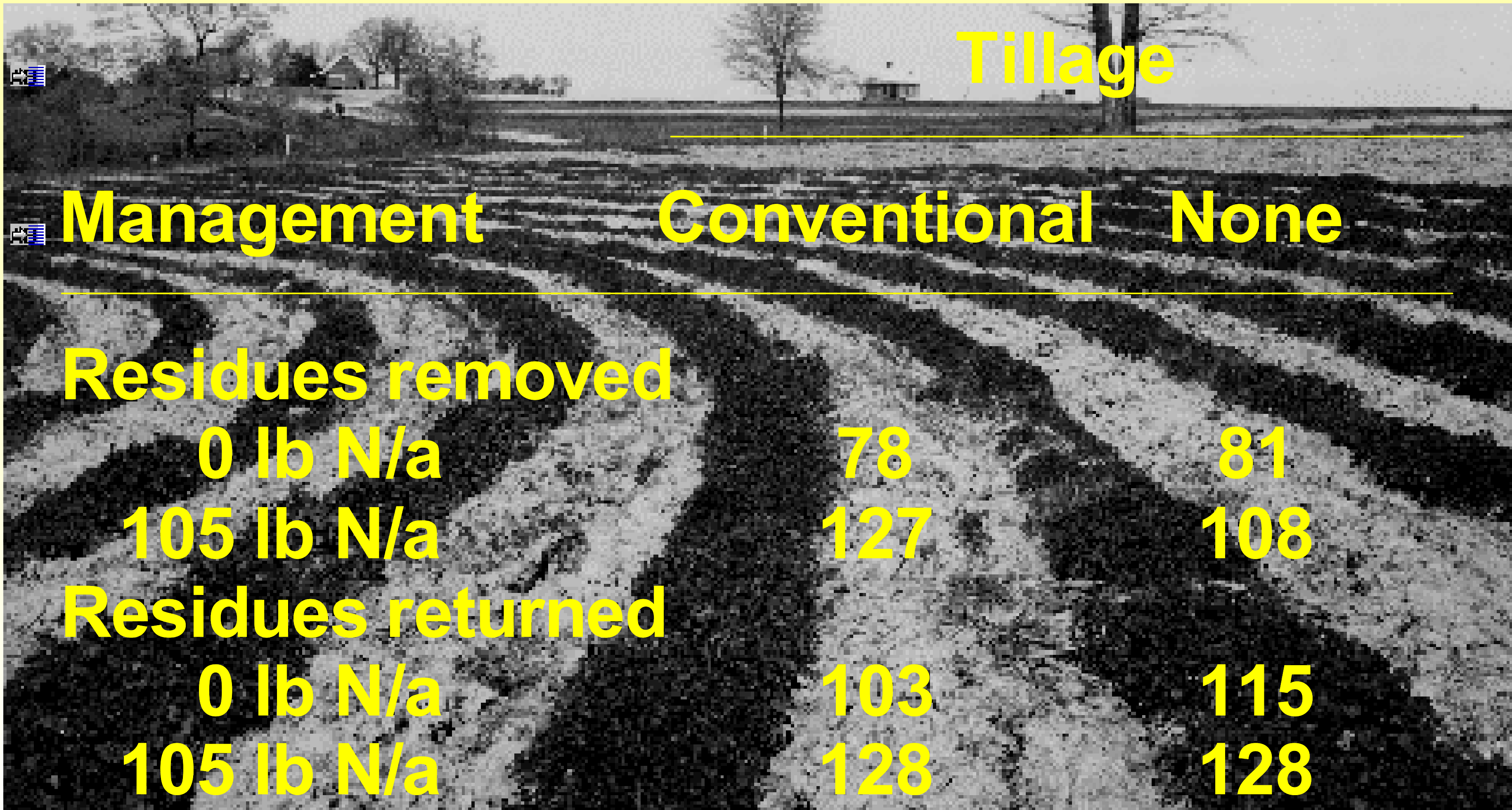
Long Rotations

Water runoff and soil loss from continuous cotton and lespedeza sod. Barnett (1965)



Short Rotations

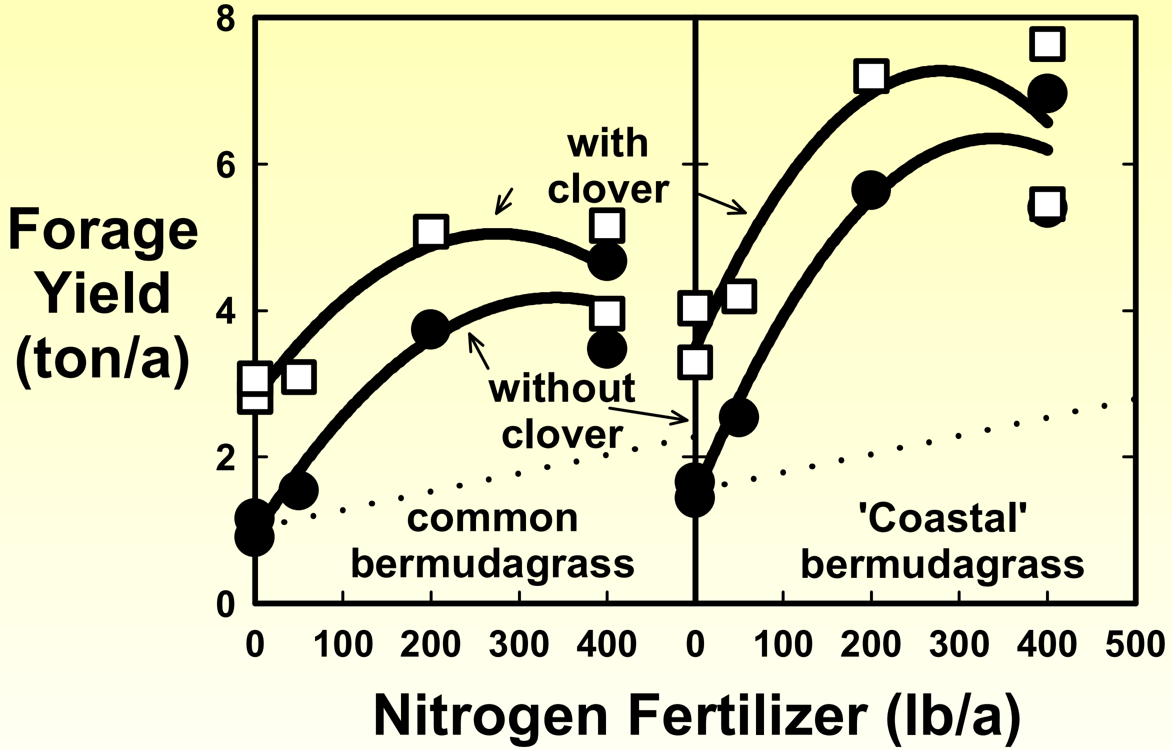
Corn grain yield with legume cover crop management under CT and NT. Wilkinson and Dobson (1977)

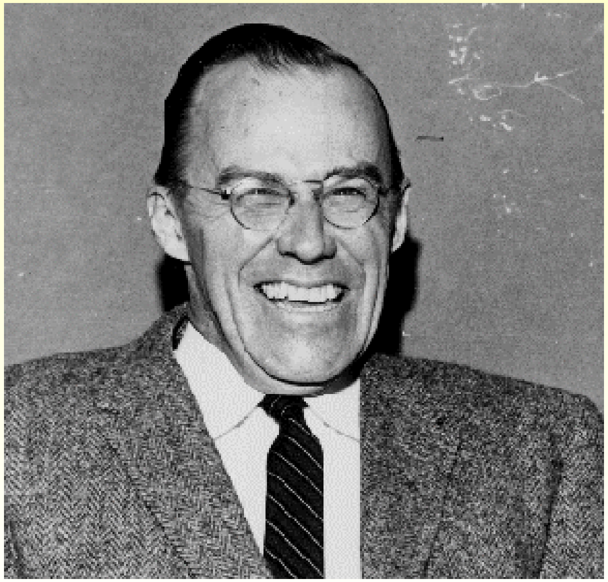


	Tillage	
Management	Conventional	None
Residues removed		
0 lb N/a	78	81
105 lb N/a	127	108
Residues returned		
0 lb N/a	103	115
105 lb N/a	128	128

Short Rotations

Forage yield response to N fertilizer as affected by overseeding with crimson clover. Adams et al. (1967)





William E. Adams

Intercropping

Mean corn grain yield (1970-71) and tall fescue herbage mass as affected by sod control. Carreker et al. (1973)

Killed Sod	----- Live Sod -----	
Corn	Corn	Forage
(bu/a)	(bu/a)	(ton/a)
158	84	2.9

John R. Carreker

Intercropping

Corn grain yield and tall fescue forage yield as affected by row width and corn population. Harper et al. (1980)

Density (1000/a)	Corn (bu/a)	Tall Fescue (ton/a)	Total (ton/a)
20% sod killed (8" killed in 40" rows)			
8.4	84	4.3	8.0
10.7	95	3.9	8.2
13.9	109	3.5	8.4
26.7	121	2.9	8.7
40% sod killed (8" killed in 20" rows)			
17.3	124	2.9	8.7
20.7	136	2.4	8.9
28.4	138	1.9	8.7
50.2	112	1.5	8.2

Intercropping

Corn grain and forage yields as affected by tall fescue management. Wilkinson et al. (1987)

Mgmt	Corn (bu/a)	T Fescue (ton/a)
Conv. Till	156	1.3
No Tillage		
20% sod-kill	58	3.4
40% sod-kill	95	2.8
100% sod-kill	176	1.7

Stan Wilkinson

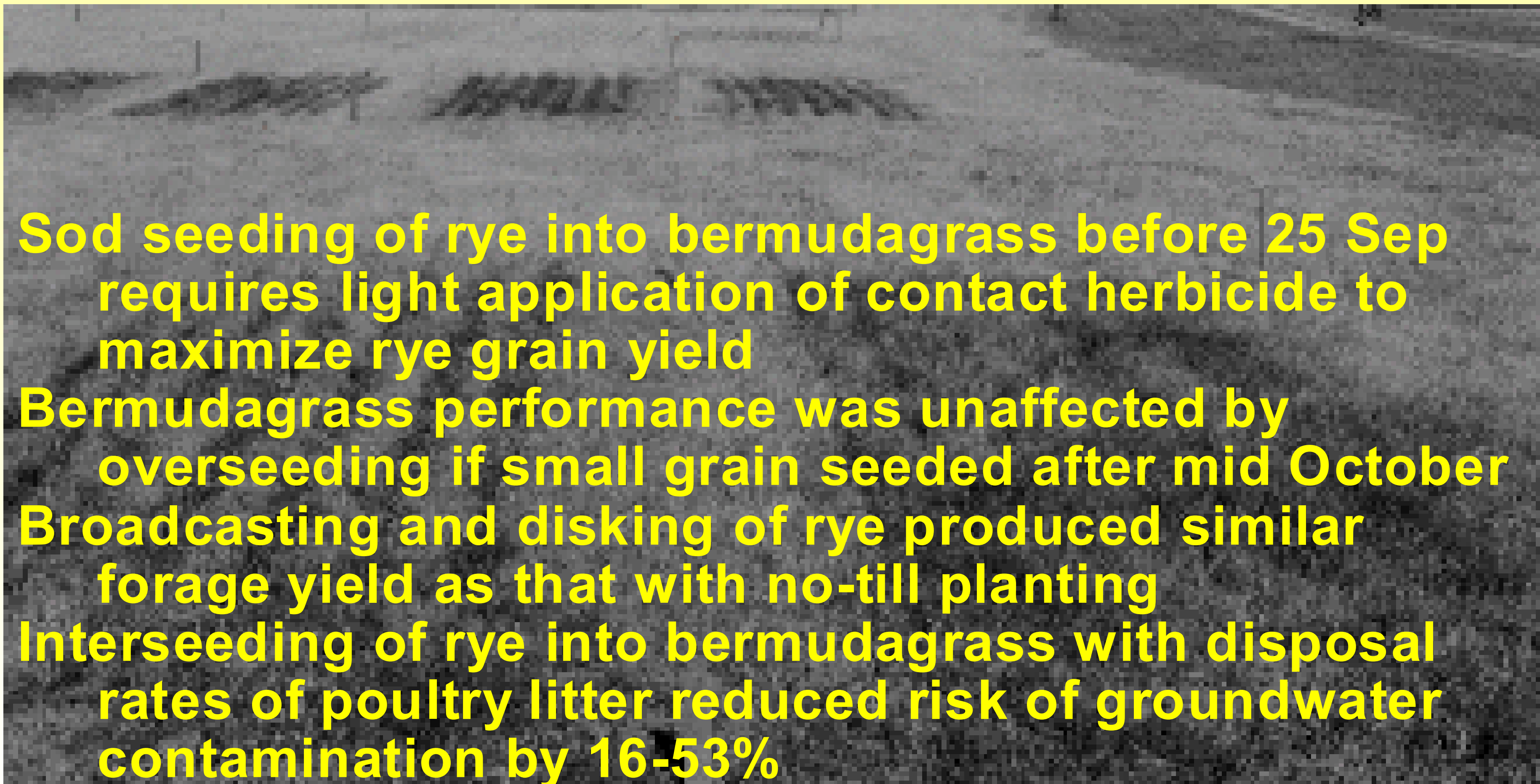
Forage Management

Mean annual forage production (1973-76) of tall fescue interseeded with sudangrass. Belesky et al. (1981)

Management	Summer yield (ton/a)	Winter yield (ton/a)	Total yield (%)
Tall fescue only	2.3	1.0	100
TF interseeded with sudangrass			
0% strip-killed	2.2	1.1	80
25% strip-killed	3.0	0.8	57
50% strip-killed	3.3	1.0	47
TF interseeded with sudangrass and rye			
100% killed	3.5	1.3	0

Forage Management

Increasing year-round forage availability with small grains sown into bermudagrass



- Sod seeding of rye into bermudagrass before 25 Sep requires light application of contact herbicide to maximize rye grain yield
- Bermudagrass performance was unaffected by overseeding if small grain seeded after mid October
- Broadcasting and disking of rye produced similar forage yield as that with no-till planting
- Interseeding of rye into bermudagrass with disposal rates of poultry litter reduced risk of groundwater contamination by 16-53%

Conclusions

- Soil conservation and agronomic production of sod-based cropping systems important
  - Sods are effective in increasing water infiltration and decreasing soil loss
  - Crop yield and soil fertility enhanced following sods
  - Legume cover crops effective at supplying N
  - Intercropping in sod requires irrigation for assurance of success, but conservation benefit of sod maintained
- Long-term, systems approach still needed
- More research needed on impacts of animal grazing in crop-pasture system designs